DOCUMENT RESUME

ED 121 011 EC 082 520

AUTHOR Alston, Herbert L.; And Others
TITLE Factor Analysis of the Test Performance of Institutionalized EMR Children on the WISC and ITPA.
PUB DATE Jan 74
NOTE 10p.

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage
DESCRIPTORS Childhood; *Educable Mentally Handicapped; Exceptional Child Education; *Factor Analysis; Intelligence Tests; Mentally Handicapped; Psycholinguistics; *Test Validity
IDENTIFIERS Illinois Test of Psycholinguistic Abilities; Wechsler Intelligence Scale for Children

ABSTRACT

The WISC (Wechsler Intelligence Scale for Children) and ITPA (Illinois Test of Psycholinguistic Abilities) test scores of a group of 54 educable mentally retarded (EMR) students (mean age 12 years) were factor analyzed to determine the extent to which the WISC and ITPA measured common factors. Of the four factors obtained, nine of the ten ITPA subtests and none of the WISC subtests loaded high on factor 1 (general ITPA). Factors 2, 3, and 4 were primarily defined by the various WISC subtests and were interpreted as a verbal factor, a visual-performance factor, and a vocabulary factor respectively. For EMR Ss, the ITPA did not measure the same factors measured by the WISC, nor did it appear to measure distinct cognitive abilities. (Author/SB)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED121011

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

74 - 102 A

Factor Analysis of the Test Performance of Institutionalized EMR Children on the WISC and ITPA

Herbert L. Alston, James A. Wakefield, Jr.,
James A. Rice

University of Houston

Billy D. Burleson

Baylor University

Mexia State School

January 3, 1974

FC08225 20

Factor Analysis of the Test Performance of Institutionalized EMR Children on the WISC and ITPA

Abstract

The WISC and ITPA test scores of a group of EMR students were factor analyzed to determine the extent to which the WISC and ITPA measured common factors. The WISC and ITPA did not seem to measure the same factors with this group of children. Four factors were obtained. Nine of the ten ITPA subtests and no WISC subtest loaded high on factor 1. Factors 2, 3, and 4 were primarily defined by the various WISC subtests and were interpreted as a verbal factor, a visual-performance factor, and a vocabulary factor respectively.

Factor Analysis of the Test Performance of Institutionalized EMR Children on the WISC and ITPA

There have been several factor-analytic studies of the 1961 edition of the Illinois Test of Psycholinguistic Abilities (ITPA) (Carroll, 1972) and a few factor-analytic studies with the revised edition of the ITPA (Burns & Watson, 1973; Doughtie, Wakefield, Sampson, & Alston, in press; Hare, Hammill, & Bartel, 1973). There have also been factor-analytic studies of the Wechsler Intelligence Scale for Children (WISC) (Cohen, 1959; Silverstein, 1969). Also, there are factor-analytic studies of the 1961 edition of the ITPA which employed retarded subjects (e.g., Horner, 1967) and some factor-analytic studies of the WISC which used retarded subjects (Baumeister, 1964; Belmont, Birch, & Belmont, 1967). The authors know of no factor-analytic study of the revised ITPA which has used retarded subjects. Leton (1972) factor-analyzed both the WISC and ITPA scores for a sample of learning disabled pupils, but the authors know of no factor-analytic study in which the performance of retarded individuals on both the WISC and ITPA has been investigated.

The ITPA was developed to serve as a diagnostic instrument, that is, the test results could be used to specify specific disabilities (Kirk & McCarthy, 1961). However, the practical usefulness of the ITPA with the educable mentally retarded (EMR) is yet to be determined. Nevertheless, it is increasingly being used as a diagnostic instrument with such individuals. In addition it may be asked whether the ITPA is basically a general abilities test (Carroll, 1972) comparable with the WISC. Factor-analysis of a test battery including the WISC and ITPA scores of a group of EMR students may address itself to the following questions: how many factors are necessary to account for the variance of these two tests; of

these factors, how many are primarily accounted for by the WISC and how many are accounted for by the ITPA; and to what extent is the administration of both the WISC and ITPA redundant?

Method

Subjects

The protocals of all EMR students who had been administered a battery of tests including the revised edition of the ITPA and the WISC at a large, state, residential institution were collected. The total number of subjects who had been administered the ten basic scales on both the WISC and ITPA was 54. The range of ages was from 8 years and 2 months to 16 years and 7 months with a mean of 12 years and 5 months and a standard deviation of 2 years and 4 months. There were 27 males and 27 females. There were 35 whites, 17 blacks and 2 students of Latin American descent. The means and standard deviations respectively of the WISC IQ's were as follows: VIQ - 54.8, S.D. - 8.5; PIQ - 57.3, S.D. - 11.9; and FSIQ - 53.3, S.D. - 8.2.

Factor Analysis

Pearson product moment correlations between each pair of the ten basic scales of the WISC and the ten basic scales of the ITPA were computed. The resulting correlation matrix (see Table 1) was tested for significance using Bartlett's test (Weiss, 1970). With 190 degrees of freedom, the resulting chi-square of 783.05 was well beyond the .001 level of significance, and indicates that the matrix is significantly different from the identity matrix. As Bartlett's test takes the number of subjects into account in computing the significance of the correlation matrix, the fact that the correlation matrix was significant indicates that the matrix is suitable for factoring in spite of the relatively small number of subjects employed.

- -

Insert Table 1 about here

- -

The matrix was factored by the principal components method (Harman, 1967). The solution, consisting of all factors with eigenvalues of one or larger, was rotated by the Varimax method.

Results

Factors

Four factors with eigenvalues of one or larger were obtained. The factor matrix is presented in Table 2. These four factors accounted for 70.6 percent of the total variance.

- -

Insert Table 2 about here

- -

Factor 1 accounted for 32.2 percent of the total variance with all the basic subtests of the ITPA with the exception of the Auditory Memory subtest loading highly (above .40) on it. It would thus seem that factor 1 is a general measure of language ability as measured by the ITPA.

Factor 2 accounted for 19.3 percent of the total variance and is composed of WISC subtests (Information, Comprehension, Arithmetic, Similarities, Block Design, and Coding) and the Auditory Memory subtest of the ITPA. Factor 2 would seem to be primarily measured by the WISC and it would seem to be a verbal factor.

Factor 3 accounted for 11.5 percent of the total variance with the following subtests loading highly on it: Picture Completion, Block Design, Object Assembly, Coding on the WISC and Visual Memory on the ITPA. This factor would seem to be a visual-performance factor.

Factor 4 accounted for 7.6 percent of the total variance and two subtests loaded high on this factor: Vocabulary and Picture Arrangement. This would seem to be a verbal factor not generally measured by the other subtests of either the WISC or the ITPA. For convenience it is labeled a vocabulary factor.

Discussion

Apparently, for EMR children the WISC and ITPA do not measure the same factors. The Auditory Memory subtest is the only subtest on the ITPA which did not load highly on factor 1, which seems to measure a general language factor. Also, none of the WISC subtests loaded highly on factor 1. Factor 2, a verbal factor, is composed of six subtests on the WISC and the Auditory Memory subtest on the ITPA. Factor 2, then, is primarily measured by the WISC. Factor 3, a visual-performance factor is measured by four subtests on the WISC and the Visual Memory subtest of the ITPA. Factor 4, a vocabulary factor, is measured by two WISC subtests. Consequently, while there is some overlap in the factors measured by the WISC and ITPA for EMR students, the two instruments are not redundant. Additionally, the factoral structure of the WISC and ITPA for the EMR students is noteworthy. More factors might have been expected for the ITPA than for the WISC. However, the ITPA primarily measured one factor, whereas the WISC accounted for three other factors.

Further studies of the performance of EMR students on the ITPA would seem to be warranted since it is increasingly used with the retarded and since the appropriateness of its use with EMR students is yet to be determined. For retarded subjects, the ITPA does not measure those factors measured by the WISC, nor does it appear to measure distinct cognitive abilities.

Intercorrelation of WISC and ITPA Subtests

Subtest	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Information																			
2. Comprehension	48																		
3. Arithmetic	49	48																	
4. Similarities	49	50	54																
5. Vocabulary	34	31	29	25															
6. Picture Completion	42	44	38	30	29														
7. Picture Arrangement	34	26	35	25	36	21													
8. Block Design	60	37	58	54	36	55	44												
9. Object Assembly	24	36	43	22	35	55	35	50											
10. Coding	43	40	37	34	-02	49	32	42	33										
11. Auditory Reception	36	35	17	26	33	36	25	22	26	26									
12. Visual Reception	38	28	20	25	31	42	22	21	26	28	82								
13. Auditory Association	37	35	11	25	34	36	15	14	15	24	90	79							
14. Visual Association	47	25	22	23	33	41	27	25	23	30	82	84	76						
15. Verbal Expression	18	20	02	09	43	25	19	20	20	11	59	62	60	57					
16. Manual Expression	17	38	06	08	18	29	10	11	20	13	67	62	59	52	64				
17. Grammatic Closure	33	20	-04	10	33	26	07	05	-02	11	86	72	90	72	58	57			
18. Visual Closure	40	37	12	14	36	41	25	22	34	32	81	81	79	81	70	66	73		
19. Auditory Memory	49	50	60	40	25	36	22	48	37	40	42	41	40	41	15	28	27	30	
20. Visual Memory	34	23	15	15	07	49	22	25	40	36	55	65	50	68	48	50	44	65	27

te.-Decimals omitted.

Table 2

Rotated Factor Matrix

Variables	Factors				
	I General ITPA	II Verbal WISC	III Performance WISC	IV Vocabulary WISC	h^2
Information	27	*72*	13	11	62
Comprehension	22	*66*	17	10	51
Arithmetic	-07	*76*	25	19	69
Similarities	07	*78*	-01	11	63
Vocabulary	27	24	-01	*84*	82
Picture Completion	28	37	*64*	05	63
Picture Arrangement	07	28	36	*50*	46
Block Design	-00	*63*	*44*	33	70
Object Assembly	07	21	*75*	34	74
Coding	14	*50*	*54*	-29	65
Auditory Reception	*90*	25	07	08	88
Visual Reception	*86*	20	19	05	82
Auditory Association	*90*	24	-04	04	88
Visual Association	*83*	24	19	05	79
Verbal Expression	*73*	-08	16	37	69
Manual Expression	*74*	02	17	04	57
Grammatic Closure	*91*	11	-18	05	87
Visual Closure	*87*	11	28	13	86
Auditory Memory	26	*71*	15	-01	59
Visual Memory	*62*	06	*58*	-13	74
Eigenvalues	6.44	3.86	2.31	1.52	14.13
Percent of Total Variance	32.2	19.3	11.5	7.6	70.6

Note.-Loadings above .40 appear in italics. Decimals omitted.

References

Baumeister, A. A. Use of the WISC with mental retardates: a review. American Journal of Mental Deficiency, 1964, 69, 183-194.

Belmont, I., Birch, H. G., & Belmont, L. The organization of intelligence test performance in educable mentally subnormal children. American Journal of Mental Deficiency, 1967, 71, 969-976.

Burns, G. W., & Watson, B. L. Factor analysis of the revised ITPA with underachieving children. Journal of Learning Disabilities, 1973, 6 (6), 36-41.

Carroll, J. B. Review of ITPA. In Buros, O. K. (Ed.), The Seventh Mental Measurements Yearbook. Highland Park, N.J.: Gryphon Press, 1972, pp. 819-823.

Cohen, J. The factorial structure of the WISC at ages 7-6, 10-6, and 13-6. Journal of Consulting Psychology, 1959, 23, 285-299.

Doughtie, E. B., Wakefield, J. A., Jr., Sampson, R. N., & Alston, H. L. A statistical test of the theoretical model for the representational level of the ITPA. Journal of Educational Psychology (in press).

Hare, B. A., Hammill, D. C., & Bartel, N. R. Construct validity of selected subtests of the ITPA. Exceptional Children, 1973, 40, 13-20.

Harman, H. H. Modern Factor Analysis. Chicago: University of Chicago Press, 1967.

Horner, D. A factor analysis comparison of the ITPA and the PLS with mentally retarded children. Exceptional Children, 1967, 34, 183-189.

Kirk, S. A., & McCarthy, J. J. The Illinois Test of Psycholinguistic Abilities - an approach to differential diagnosis. American Journal of Mental Deficiency, 1961, 66, 399-412.

Leton, D. A. A factor analysis of ITPA and WISC scores of learning-disabled pupils. Psychology In The Schools, 1972, 9, 31-36.

Silverstein, A. B. An alternative factor analytic solution for Wechsler's intelligence scales. Educational and Psychological Measurement, 1969, 29, 763-767.

Weiss, D. J. Factor analysis and counseling research. Journal of Counseling Psychology, 1970, 17, 477-485.